

# RESEARCH SPOTLIGHT

## Project Information

**REPORT NAME:** Evaluation of Dynamic Speed Feedback Signs on Freeway Interchange Ramps

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## MDOT Project Manager



### Alonso Uzcategui, P.E.

Traffic Signing Engineer  
MDOT Traffic and Safety

[UzcateguiA@Michigan.gov](mailto:UzcateguiA@Michigan.gov)  
517-335-2624

### RESEARCH ADVISORY PANEL MEMBERS:

Josh Carey, Elise Feldpausch, Dean Kanitz, Ray Olsen, Stephanie Palmer, Michael Townley, and Kim Zimmer.

## Dynamic signs along Michigan's freeway ramps improve driver behavior

Like other transportation agencies in the United States, the Michigan Department of Transportation (MDOT) devotes significant resources toward reducing lane departure crashes, which account for nearly half of all traffic fatalities nationwide. Freeway exit and entrance ramps, which often require drivers to slow down significantly to navigate a horizontal curve, are common crash sites. To lower the risk, MDOT installed and tested dynamic speed feedback signs at six critical sites and evaluated their effectiveness on driver behavior. With promising results in hand, MDOT developed guidance for implementing these life-saving devices statewide.

### PROBLEM

Crashes that occur when a vehicle crosses over the center or edge line of the roadway are frequently severe and often fatal. These crashes, which can result in head-on collisions or leaving the road altogether, comprise slightly less than half of all traffic-related deaths in Michigan – and national studies report similar statistics. The risk of these lane departure crashes is even higher where horizontal curves are present, such as freeway interchange ramps, which also demand drivers reduce their travel speeds significantly to navigate the road.



Dynamic signs can be an effective speed-reduction strategy for vehicles leaving the freeway.

Dynamic speed feedback signs, which use radar to measure passing vehicles' real-time speeds and issue targeted warning messages to drivers, offer a promising solution to help alter their behavior and reduce crashes. While the devices are often used successfully in Michigan to remind

*"In keeping with MDOT's commitment to safety and the Toward Zero Deaths initiative, this project provides a promising strategy for reducing traffic crashes and fatalities across the state."*

**Alonso Uzcategui, P.E.**  
Project Manager

drivers to slow down in school zones and near roadway work zones, MDOT hasn't used them frequently at freeway entrances and exits. To learn whether the signs could work effectively to reduce speeds at these locations as well, MDOT engaged a team of researchers to conduct a series of tests and provide recommendations.

## RESEARCH

The researchers began by reviewing published policies and technical guidance regarding the use of dynamic speed feedback signs and surveying other state DOTs about their experiences with the devices. These resources provided support in favor of using the signs as a speed countermeasure and offered valuable suggestions for maximizing the signs' effectiveness. Only a few DOTs indicated they had used the devices at freeway exit ramps, signifying the innovation in this line of research.

The team applied lessons learned from around the country to field evaluations in Michigan, selecting several commercially available signs and installing them at six freeway interchange ramps in the state. Testing a variety of variables and configurations, the researchers assessed the different signs' physical characteristics, detection capabilities, placement along the ramp, and effectiveness at influencing driver speeds and behavior.

## RESULTS

The field evaluations consistently showed the dynamic speed feedback signs successfully lowered speeds as vehicles approached and entered the curves at freeway exit ramps. With data collected from the test sites, researchers identified a variety of optimization strategies that resulted in average speeds that were up to 4 mph lower than when the signs were not present.

To help MDOT's traffic engineers replicate the signs' success statewide, the researchers developed a series of best practices for designing, operating and installing effective dynamic speed feedback signs at freeway interchanges.

**Site selection** – Prime locations include exit ramps that have experienced frequent lane departure crashes in the past, where the average vehicle enters the ramp at least 10 mph faster than the posted speed limit and at sites that have sufficient space and visibility to accommodate a sign safely.

**Messaging strategies** – Signs should display a vehicle's actual speed when a driver is traveling no more than 10 mph over the posted limit. For vehicles exceeding the limit by 10 mph or more, the speed number should alternate with a "SLOW DOWN" message.

**Design characteristics** – To increase visibility, signs should include reflective elements and be large enough to display amber letters and numbers that are at least 15 inches high.

**Installation guidance** – Signs should be placed on the right-hand side and within 250 feet of the start of the ramp's curve. The radar that detects approaching vehicles should be placed at least 250 feet ahead of the curve to give drivers ample time to slow down.

## IMPLEMENTATION

With substantial data confirming that speed feedback signs work to improve driver behavior, as well as guidance for expanded use across the state, MDOT is better positioned to reduce the number of traffic

deaths in Michigan. As the agency continues to collect additional data in the coming years, the signs' impact on the frequency and severity of crashes will become clearer. Future data will also help MDOT determine whether the signs' behavior-improving effects change over time as drivers become more accustomed to seeing them and provide additional guidance on how best to deploy this technology.

## Research Administration

### Principal Investigator

**Timothy Gates, Ph.D.**

Professor  
Michigan State University  
Department of Civil and  
Environmental Engineering  
428 S. Shaw Lane, Room 3573  
East Lansing, MI 48824

[gatestim@egr.msu.edu](mailto:gatestim@egr.msu.edu)  
517-353-7224

### Contact Us

PHONE: 517-281-4004

E-MAIL: [MDOT-Research@Michigan.gov](mailto:MDOT-Research@Michigan.gov)

WEBSITE: [Michigan.gov/MDOTResearch](http://Michigan.gov/MDOTResearch)

**This final report is available  
online at**

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